



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

David A. DALMAN et al.:

Serial No. 09/880,834:

Group Art Unit: 1771

Filed on June 15, 2001:

Examiner: Elizabeth M. Cole

For: BALLISTIC-RESISTANT ARTICLE AND  
PROCESS FOR MAKING THE SAME

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner of  
Patents and Trademarks,  
Washington, D.C. 20231

Sir:

I, Yukihiro NOMURA, whose full post office address is  
c/o Toyo Boseki Kabushiki Kaisha, Functional Fiber  
Development Center, 1-1, Katata 2-chome, Ohtsu-shi, Shiga  
520-0292 Japan, sincerely declare:

That my education and employment history is as follows:

I was graduated from Nagoya Institute of Technology in  
March 1986, completed the graduated school in 1988 and

In April 1988, I was employed by Toyo Boseki Kabushiki  
Kaisha, and I have been engaged in the research and  
development of high-strength fibers, especially composite  
materials and bullet-proof materials at Toyo Boseki  
Functional Fiber Development Center;

That I am familiar with the subject matter of the  
above-identified U.S. Patent Application No. 09/880,834;

That I have reviewed the Office Action dated June 4,  
2003 in the above-identified application and have directly  
conducted the following experiments to show that a fabric  
or clothing article prepared using polybenzoxazole fibers,  
which are untwisted and are of not more than 500 denier, is  
extremely superior in ballistic resistance;

That the following demonstrates such fact;

## Experiments

### (1) Preparation of specimens

#### A. Manufacture of fabric

Using a PBO filament having a fineness and the number of twist shown in the following Table, a plain woven fabric made of the PBO filament, which had the density and fabric weight (Metsuke) shown in the following Table, was prepared.

#### B. Manufacture of test pieces

The fabric made of the PBO filament obtained in the above was cut into 200 mm square pieces and the pieces in the number shown in the following Table were laminated. The four corners of the resulting laminate were sewn by a sewing machine to give test pieces.

	Fine- ness (denier)	Number of twist (T/M)	Struc- ture	Density (g/cm <sup>3</sup> )	Fabric weight (Metsuke) (g/m <sup>2</sup> )	Number of lami- nates	Laminate weight (g)
Exp. 1	500	0	Plain weave	30	135	36	4864
Exp. 2	500	80	Plain weave	45	213	25	5319
Exp. 3	1000	0	Plain weave	31	285	18	5139

### (2) Ballistic test

The test pieces prepared above were subjected to a ballistic test according to USA Department of Defense - Test Method Standard MIL-STD-662F (Ballistic Test for Armor) to determine V50 value. The bullet used was a 9 mm FMJ (full metal jacket).

Note that V50 (m/sec.) means the average velocity, at which a bullet or a fragment penetrates the armor equipment in 50% of the shots, versus non penetration of the other 50%.

(3) Results of Experiment

The obtained results are shown in the following Table.

	V50 (m/sec.)
Experiment 1	585
Experiment 2	493
Experiment 3	512

The test piece of Experiment 1 showed a significantly greater V50 value than did the test pieces of Experiment 2 and Experiment 3.

(4) Conclusion

From the above-mentioned results, it is clear that a fabric or clothing article made from polybenzoxazole fibers, which are untwisted and are of not more than 500 denier, is markedly superior in the ballistic resistance.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed at Shiga, Japan on this 27<sup>th</sup> day of November, 2003

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Yukihiro NOMURA